

Sacramento-San Joaquin Delta Waterways Diazinon and Chlorpyrifos TMDL/Basin Plan Amendment



**Public Workshop
April 2006**

Introductions

- Danny McClure, Water Resource Control Engineer, Pesticide TMDL Unit
- Joe Karkoski, Chief, Pesticide TMDL Unit

Agenda

- Introduction and Background (15 min) 1:00-1:15
- Basin Plan Amendment alternatives and analysis
 - Beneficial Uses (10 min) 1:15 - 1:25
 - Water Quality Objectives (20 min) 1:25 - 1:45
- Break (10 min) 1:45 - 1:55
- Implementation program (30 min) 1:55 - 2:25
- Monitoring (5 min) 2:25 - 2:35
- Cost analysis (5 min) 2:30 - 2:35
- Peer review comments (10 min) 2:35 - 2:45
- Summary and next steps (5 min) 2:45 - 2:50
- Additional questions/discussion 2:50 - 3:00
- Includes Time for questions at the end of each section

Where we are in the Process

Delta Waterways 303(d) listed	1996
TMDL/BPA development	2003
CEQA Scoping Meeting	Jan 2005
Peer Review Draft	Feb 2006
Public Review Draft	April 2006
Public Workshop	April 2006
Regional Water Board Hearing	June 2006
State Board Hearing	Estimated – Dec 2006
Office of Administrative Law Approval	Estimated – March 07
USEPA Approval	Estimated – June 07

Legal Requirements

- 303(d) listing requires TMDL development under Clean Water Act
- Bay Protection Clean-up Plan requires adopting water quality objectives, program of implementation, TMDLs

Relationship with other Regional Water Board Activities and Regs.

- Amendment to the Basin Plan
 - Numeric Water Quality Objectives and Implementation Program
- Likely implemented through existing Waivers and WDRs (Sac/Feather River Diazinon Framework)
- Meeting Bay Protection Clean-up Plan requirements

CDPR Regulatory Actions

- DPR dormant spray regulations.
- Supplemental label for diazinon in place
- Updated label for chlorpyrifos under DPR review
- New regulations and labels require management practices that should improve water quality

Common Elements with Previous Board Actions

- San Joaquin River (2005) and Sac/Feather (2003)
 - Water quality objectives
 - TMDL elements - loading capacity and allocations
 - Prohibition as backstop
 - Policies regarding alternative pesticides
 - 5 year compliance schedule
 - Review 1 year before compliance
 - Submittal of management plans
 - Monitoring goals

Common Elements with Previous Board Actions

- San Joaquin River and Sac Urban Creeks
 - Address both diazinon & chlorpyrifos
 - Use additivity formula in Basin Plan to establish loading capacity

Project Area

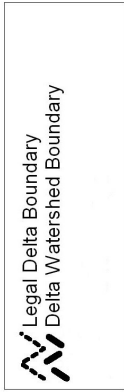
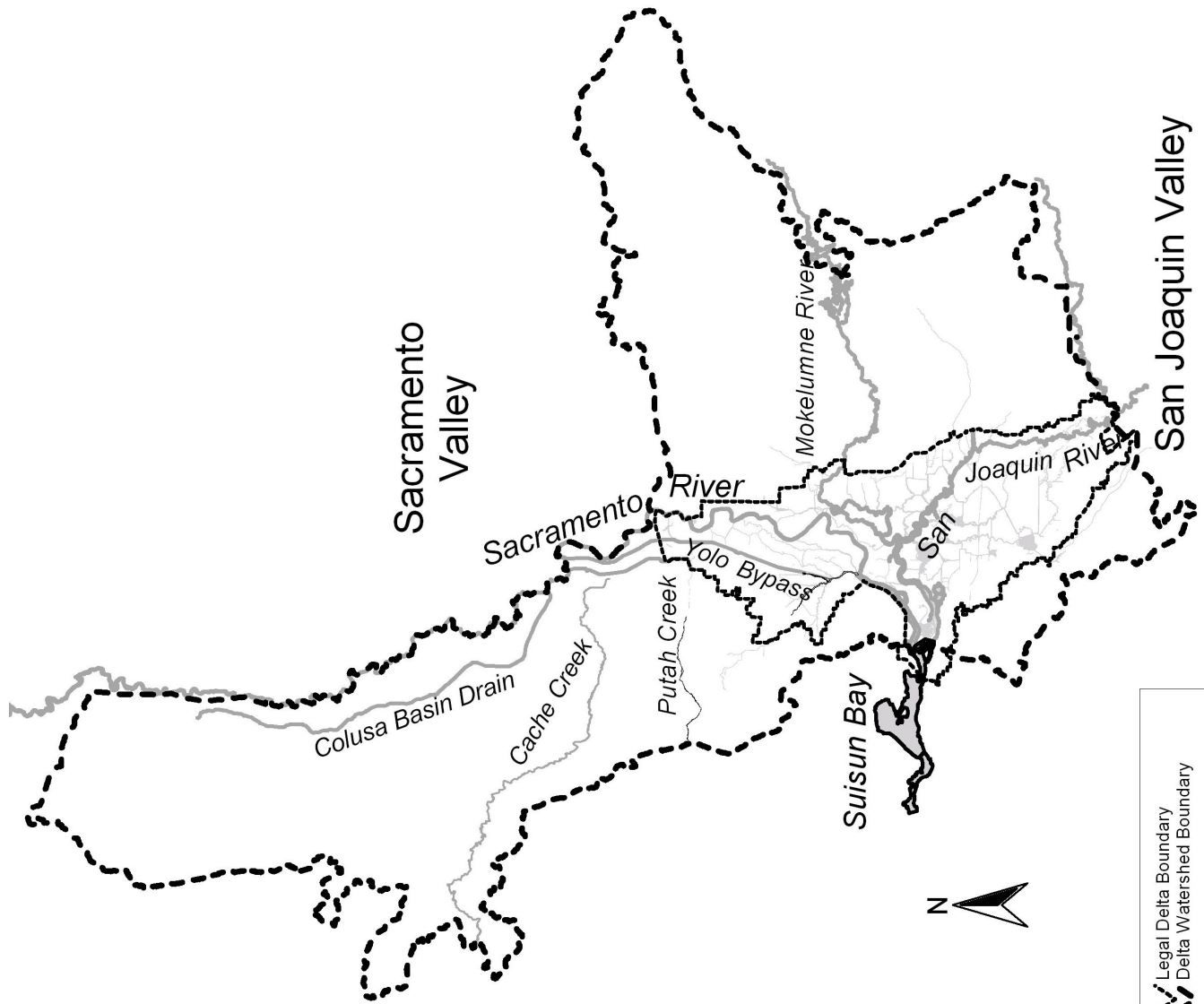
- The Delta
 - Legally defined boundaries
 - Agricultural and urban land uses, extensive levy system
 - Complex hydrology
 - Rivers, tides, withdrawals, backwaters

Project Area

- Delta Waterways
 - Referred to by geographic area in 303d listing
 - Proposed Amendment names 143 specific Delta Waterways
 - clarify application of the water quality objectives and loading capacity.
 - hydrologically connected by surface water flows
 - Only includes reaches within the Legal Delta
 - Doesn't include canals or drains not directly hydrologically connected

Project Area

- The Delta Watershed
 - Used to identify sources/pesticide use
 - Areas draining to the Legal Delta
 - Below reservoirs
 - Not including areas draining to Sac, SJR upstream of the Legal Delta
 - Colusa Basin included



Diazinon and Chlorpyrifos Use

- Agricultural and urban uses
- Urban uses – almost all canceled by end of 2004
- Diazinon - dormant orchards
- Chlorpyrifos – irrigation season – orchards, alfalfa
- Significant decline in agricultural uses
- Staff Report discusses uses by season, crop, year, and uses in different geographic areas

Diazinon and Chlorpyrifos Properties

- Organophosphorous (OP) insecticides
- Not highly persistent
- Toxic to aquatic invertebrates at low concentrations
- Diazinon – mostly in dissolved form
- Chlorpyrifos – greater tendency to adsorb to sediments, but still present in dissolved form
- Additive toxicity
- Commonly found in stormwater and irrigation runoff
- Atmospheric transport and deposition

Drift and Volatilization

Runoff

Stream

River



Diazinon and Chlorpyrifos in the Delta

- Early 90's diazinon and chlorpyrifos at toxic concentrations throughout the Delta
- 1996 Clean Water Act 303(d) list of impaired waters
- Several more recent studies (mid 90's – present)
 - Confirm continued presence at levels of concern
 - Lower concentrations than early 90's

Questions?



Basin Plan Amendment Alternatives and Analysis

- Beneficial Uses
- Water Quality Objectives
- Implementation Program
- Monitoring
- Estimated Costs

Beneficial Uses Alternatives

- No changes
- Modification
 - Sub category of aquatic life beneficial uses
- Addition of BU's
 - Endangered species, commercial and sport fishing, etc.

Beneficial Uses

- No change recommended
- Aquatic life BU's most sensitive to diazinon and chlorpyrifos
- Biology of Delta – aquatic life beneficial uses appropriate for Delta Waterways
- Aquatic life BU's support the establishment of appropriate Water Quality Objectives

Questions?



Water Quality Objectives

- Protective of Beneficial Uses
 - Aquatic life BU's most sensitive
- Consistent with other laws and policies
- Delta Considerations
 - Quality of inflows from Sacramento and San Joaquin Rivers
 - Adopted WQOs for diazinon and chlorpyrifos
 - Salinity effects
 - Salinity of 2 parts per thousand at Delta outlet

Water Quality Objectives Alternatives

- No change
- No diazinon or chlorpyrifos
- Propose new water quality objectives
 - USEPA methodology
 - Australia and New Zealand Methodology
 - Canadian Methodology
- Assessed for consistency with Porter Cologne and other State and Federal requirements
- Compared to available delta conc. data
- Not necessarily the same action for both pesticides

No Change to WQO's

- Continue implementing narrative toxicity WQO
 - Recalculated CDFG criteria
 - 1/10 lowest LC50 (Basin Plan)
- Apply to additive pesticide toxicity formula

No Diazinon or Chlorpyrifos

- Any detection would be an exceedance
- Anti-degradation policy
 - Presence of any diazinon or chlorpyrifos not to the maximum benefit of the people of the State

Numeric Water Quality Objectives for Diazinon

Aquatic Life Criteria	ng/L
CDFG Aquatic Life Criteria for freshwater – 4 day avg.	50
CDFG Aquatic Life Criteria for freshwater – 1 hour max	80
Recalculated CDFG Aquatic Life Criteria for freshwater – 4 day avg.	100
Recalculated CDFG Aquatic Life Criteria for freshwater – 1 hour max	160
EPA Aquatic Life Criteria for freshwater – 4 day avg.	170
EPA Aquatic Life Criteria for freshwater – 1 hour max	170
Australian and New Zealand trigger values (95% protection- based on NOEC)	10
Australian and New Zealand trigger values (99% protection – based on NOEC)	0.03
1/10 th Most sensitive species mean average value (<i>Ceriodaphnia dubia</i>) (Basin Plan)	44

Numeric Water Quality Objectives for Chlorpyrifos

Aquatic Life Criteria	ng/L
CDFG Aquatic Life Criteria for freshwater – 4 day avg.	14
CDFG Aquatic Life Criteria for freshwater – 1 hour max	20
Recalculated CDFG Aquatic Life Criteria for freshwater – 4 day avg.	15
Recalculated CDFG Aquatic Life Criteria for freshwater – 1 hour max	25
EPA Aquatic Life Criteria for freshwater – 4 day avg	41
EPA Aquatic Life Criteria for freshwater – 1 hour max	83
Canadian Environmental Quality Guidelines	3.5
Australian and New Zealand trigger values (95% protection- based on NOEC)	10
Australian and New Zealand trigger values (99% protection – based on NOEC)	0.04
1/10 th Most sensitive species mean average value (<i>Ceriodaphnia dubia</i>) (Basin Plan)	6

Numeric Water Quality Objectives

USEPA Methodology

- Considers number of studies, variability
- Acute and chronic effects

Chlorpyrifos Criteria Using USEPA Method

- CDFG (2000) and USEPA (1986)
- Recalculated CDFG criteria - correct number of significant figures

Numeric Water Quality Objectives

Diazinon Criteria Using USEPA Method

- USEPA (2005) and CDFG (2000, 2004)
 - Acute criteria very similar (160 vs. 170)
 - Due to different studies used in calculations
 - More difference in the Chronic Criteria
 - Due to different studies used in calculations
 - Acute to chronic ratios (ACRs)
 - CDFG used 3 ACRs, USEPA used 2

Recommended Water Quality Objectives

- Adopt numeric Water Quality Objectives
 - Appropriate criteria are available
 - Clarity, Basis for TMDL Loading Capacity and Allocations
- Recalculated CDFG criteria for both Diazinon and Chlorpyrifos
 - USEPA method
 - More stringent criteria for inclusion of studies
 - Chlorpyrifos criteria – more recent toxicity studies for sensitive species
 - Diazinon – additional chronic studies of sensitive species

Recommended Water Quality Objectives

- Diazinon
 - 160 ng/L Acute (1 hour maximum)
 - 100 ng/L Chronic (4 day avg.)
- Chlorpyrifos
 - 25 ng/L Acute (1 hour maximum)
 - 15 ng/L Chronic (4 day avg.)
- Not to be exceeded more than once every 3 years
- Protective of Beneficial Uses
- Apply to named Delta Waterways

Recommended Water Quality Objectives

- Freshwater criteria most appropriate
 - Diazinon freshwater criteria lower (more protective) than saltwater
 - Chlorpyrifos freshwater criteria higher (~75%) than saltwater
 - Delta conditions and biota more appropriately represented by freshwater criteria
 - Dilution in areas of high salinity
- Inflows from Sacramento and San Joaquin Rivers
 - Same WQOs as adopted for the San Joaquin River
 - Diazinon WQO higher than Sac River (80 ng/L)
 - Would not cause exceedances in Delta

Questions?



Program of Implementation

- TMDL
 - Loading Capacity and Allocations
- Available Practices and Technology
- Implementation Framework
- Management plans
- Time schedule for compliance

Loading Capacity

- Complex Hydrology
 - Flow reversals
 - Can't divide into subwatersheds w/ downstream compliance points
- Concentration Based
 - Compatible with tidal effects, changes in flow regimes, seasonal variations
 - No data gaps, high level of certainty in determining compliance
- Additive toxicity formula for pesticides

Additive Toxicity Formula

- Additive Toxicity:
 - Multiple pesticides increase aquatic toxicity
 - Must meet existing additivity formula for pesticides with same toxicity mechanism (e.g. cholinesterase inhibition for OP pesticides)

Additive Toxicity Formula

$$\frac{C_D}{WQO_D} + \frac{C_C}{WQO_C} \leq 1.0$$

where

C_D = diazinon concentration in the receiving water.

C_C = chlorpyrifos concentration in the receiving water.

WQO_D = acute or chronic diazinon water quality objective or criterion.

WQO_C = acute or chronic chlorpyrifos water quality objective or criterion.

Allocation of Loading Capacity

- Load Allocations to non-point sources
- Waste Load Allocations to point sources
- Margin of Safety and Seasonal Variations

Load and Wasteload Allocations

- Set equal to loading capacity
- All discharges to the Delta Waterways would need to meet the additive toxicity formula
- Waterways that flow in to the Legal Delta - allocations would need to be met at the point they enter the Legal Delta

Load and Wasteload Allocations

$$\frac{C_D}{WQO_D} + \frac{C_C}{WQO_C} \leq 1.0$$

- Implicit margin of safety
- Implicitly addresses variations in flows

Questions?



Available Practices and Technology

- Reduce loads from sources
- Pest management practices
- Pesticide application practices
- Water management practices

Implementation Framework Alternatives

- Conditional Prohibition of Discharge
- Waste Discharge Requirements (WDRs)
- Conditional Waiver of WDRs
- Short, Medium and Long Term Compliance Schedule

Recommended Implementation Program

- Conditional Waiver or WDRs expected method of implementation
- Two Conditional Prohibitions of Discharge
 - Backstop for waiver or WDRs
 - Dormant season (Dec - Feb)
If objectives or loads exceeded in previous year
 - Irrigation season (March – Sept)
If objectives or loads exceeded in previous year

Recommended Implementation Program

- Medium Term (2011) Time Schedule for Compliance
- Submission of management plans
- Management plans must be revised if loading capacity is not met and allocations exceeded

Questions?



Monitoring Alternatives

- No specified monitoring program
- General monitoring goals
- Specific monitoring plan

Monitoring

- Recommended alternative set general goals
- Similar to SJR, Sac Monitoring Goals
- Additive toxicity
- Alternate products
- Representative monitoring

Questions?



Cost Analysis

- No additional costs anticipated for point sources (urban use cancellations)
- Per acre costs based on previous detailed cost analyses
- Applied to acreage treated in the Delta Watershed
- Dormant season diazinon not included due to new label requirements
- High end estimate
 - Many requirements already existing
 - Some growers already implementing practices

Questions?



Peer Review Comments

- Thomas Holsen, Clarkson University
 - Supportive of objectives, methodology for allocations
 - Concerns about enhanced toxicity due to the other pesticides – herbicides, other OP pesticides
 - Atmospheric deposition, deposition monitoring

Peer Review Comments

Responses to Dr. Holsen

- Additive toxicity comment
 - Policies in Delta Amendment requiring monitoring for additive toxicity - additional discussion added to monitoring section of Staff Report
 - Diazinon and Chlorpyrifos would have to be lowered if contributing to toxicity
 - Herbicides below known thresholds of OP toxicity enhancement
 - Other OP pesticides not known to be as significant a concern
 - Detected much less frequently
 - Lower concentrations relative to toxic levels
 - May be further addressed in upcoming Pesticide Basin Plan Amendment

Peer Review Comments

Responses to Dr. Holsen

- Atmospheric deposition comment
 - Atmospheric deposition correlated to recent, local use, may not need atmospheric monitoring if meeting WQOs, TMDL
 - More atmospheric deposition discussion added to report

Peer Review Comments

- Alan Felsot, Washington State University
 - Supportive of objectives, methodology of allocations
 - Less monitoring necessary if widespread implementation
 - Existing monitoring stations
 - Thresholds for synergistic effects
 - Antagonistic effects
 - Alternatives likely not a toxicity concern

Peer Review Comments

Responses to Dr. Felsot

- Monitoring comments
 - Need to determine compliance with WQO's, allocations
 - May need different monitoring stations
- Antagonistic effects comment
 - Mention of antagonism added to Staff Report
 - Toxicity testing sensitive to antagonistic effects
- Toxicity thresholds, alternative products toxicity comment
 - Toxicity testing necessary to address pesticide mixtures and replacement products

Summary of Proposed Amendment

- Similar to SJR Amendment
- Numeric water quality objectives for diazinon and chlorpyrifos
- Program of Implementation
 - Loading capacity, allocations defined by additive toxicity formula
 - management plans
 - Timeline for meeting objectives and loading capacity
 - Monitoring requirements

Next Steps

- Regional Water Board Hearing, June 22/23
- Comments
 - Written comments should be submitted by June 7th
 - Suggested format for comments

Questions/Discussion